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the mines is hilly, and in places reaches altitudes of 1,000 feet. The rock immediately adjacent to the deposits is fine-grained sediment containing much siliceous cement, or hard, gray, siliceous limestone. Associated with the ore-bodies are shales and breccias, and a dark igneous rock, probably basalt.

At Mine No. 1, the manganese occurs as mixed oxides, largely in bowlders, or segregated in lenses and sheets in varicolored clays. The manganese ore may be in stringers or beds in the clay. It appears to be the result of concentration and segregation. Taking all the possible sources of manganese together, about 10,000 tons are available at this locality.

At Mine No. 2 the ore is also in bowlders, which lie on the surface, or in clay banks; here too are sheets of manganese ore, ranging in thickness to 15 feet. Manganese is also segregated in a zone in bedded breccia, formed apparently through concentration in the residual clays that weathered from the breccia.

In general, therefore, the manganese ores appear to be residual, not unlike those of the Piedmont district of southeastern United States.

C. H. B., JR.

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*The Iron and Associated Industries of Lorraine, the Sarre District, Luxemburg, and Belgium.* By ALFRED H. BROOKS AND MORRIS F. LACROIX. United States Geological Survey, Bulletin 703, 1920. Government Printing Office, Washington, D.C. Pp. 131, pls. 2, figs. 12, and numerous tables, including statistics on Belgian iron and coal production.

This report was prepared at Paris for the use of the American Commission to Negotiate Peace. It illustrates again the value of geology in fields normally considered foreign to the science. It calls to mind too the desirability of making peace-terms on the basis of such carefully organized facts with a view to stabilizing world-ind

The importance of the iron ores of Lorraine Annexee and French Lorraine may be shown by the fact that they furnished in 1913 34 per cent of the total iron consumed in Europe.

Lorraine Annexee, that part which Germany controlled subsequent to 1872, produced in 1913 75 per cent of the entire German output of iron ore. The reserves aggregated about 1,830,000,000 tons of ore averaging about 30 per cent iron. More than two-thirds of the coke used in Lorraine Annexee came from the Westphalian and Aix-la-Chapelle districts; the remainder, only some 1,500,000 tons, was from the nearby Sarre field. The European iron reserves in other fields were being rapidly depleted, and it would thus have been greatly to the interest of Germany to obtain control also of the French Lorraine field. German capital already owned 10 to 15 per cent of the entire iron district by purchase before the outbreak of the war, and if French Lorraine had been annexed, Germany would have controlled 50 per cent of Europe's iron resources. As it is, however, "the Treaty of Versailles has left Germany with only 7 per cent of Europe's iron reserves, while France owns 48 per cent. Moreover, the deposits of iron ore in the German Republic are widely scattered, and some of them are not favorably located for economic development. Therefore any large production of iron and steel in Germany must be based on imported ores." Only her Westphalian coking coals prevent the immediate annihilation of Germany's metallurgical industry; this coal, it is shown in the report, is necessary to assure the economic utilization of France's Lorraine ores.

In general the iron deposits of Lorraine occur in a belt extending northward from Metz along the pre-war frontier between France and Germany in an area averaging 60 kilometers long and 20 kilometers wide. The more southerly Nancy iron district lies entirely within the pre-war French territory and forms an outlier of the main field. The dip of the beds is gently westward, though modified by slight folds and faults.

The ores are mined at a low cost; this, taken with their great extent, their proximity to coal fields and markets, and their composition, which adapts them to the basic process, gives them their great value. The phosphorus content is 1.5 to 2 per cent, fairly constant, and yields valuable slag fertilizer. The iron mines in the occupied parts of

The Sarre fields can only contribute some 22 per cent of the needed coal, so that with the restoration of Lorraine Annexée, France holds much smaller coal reserves than either Germany or Great Britain.

In the Westphalian field of Germany the coal is close to tidewater and is connected by rail and by waterways with the iron and steel centers of Lorraine and Belgium. The district produces about half of the total German output of pig iron, and in 1913 some 45 millions of tons of Lorraine ore were smelted there. About 180 coal mines are operated. The Sarre coals lie near the Lorraine field—some thirty kilometers east—but are far inferior in coking qualities to those of Westphalia. There are from 27 to 32 workable seams, aggregating about 40 meters in thickness. The total reserve, estimated to a depth of 2000 meters, is about 16 million tons. The coal cokes but poorly, yielding on the average 50 per cent coke; in blast furnace practice, therefore, it is customary to make the charge of equal quantities of Sarre and Westphalian fuel. The Sarre coal is really best used for steam, gas, and domestic purposes.

There are no large coal reserves in Belgium, excepting possibly in the Campine Basin. The Campine coals, after development has proceeded a little further, may, with the Sarre, supply enough coal for all the Lorraine ores; but in an open market, they could not compete successfully with the higher grade Westphalian coal.

Luxemburg bears reserves of iron that should last about thirty-five years. It supports large furnaces; there were in 1913, forty-six blast furnaces and six steel plants. Of the six large corporations that control most of the stock, four are German, one Belgian, and one mixed capital.

The entire compilation is to be commended, first for its purpose—the application of economic facts to international problems—and second for its accuracy and completeness. Two good maps illustrate the geographic relations of the coal and iron districts in question; many graphs, tables, and diagrams make the salient points doubly clear.

C. H. B.,